SECTION 31 3200

SOIL STABILIZATION

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LANL MASTER SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the ESM Structural POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete information within “stars” during editing.

Specification developed for ML-3 projects. For ML-1 / ML-2, additional requirements and QA reviews are required.

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PART 1 GENERAL

1.1 SECTION INCLUDES

Provisions to modify the subgrade soils under the floor slab by pressurized intrusion/injection of portland cement grout to increase the density and stabilize the poor subgrade material.

1.2 MEASUREMENT AND PAYMENT

A. Measurement

1. The method of measurement for soil stabilization is the number of cubic yards of slurry grout mixture completed and accepted in the work.

B. Basis of Payment

1. The accepted quantities, determined as provided above, will be paid for at the contract price per unit of measurement, respectively, for each of the particular pay items listed below that is shown in the bid schedule for which prices and payment will be full compensation for the work prescribed including clean-up, disposal, and mobilization.

Pay Item	Pay Unit
Soil Stabilization	Cubic Yards

1.3 SUBMITTALS

A. Submit the following in accordance with the requirements of Section 01 3300, Submittal Procedures.:

1. Injection points installation records per paragraph 3.2E.

2. Grouting reports per paragraph 3.3D

3. Mix proportions per paragraph 3.5A

PART 2 PRODUCTS

2.1 INTRUSION GROUT MATERIALS

A. Use intrusion grout consisting of a mixture of Portland Cement and water, with or without sand and other bulk fillers, together with admixtures as may be necessary or desirable to accomplish the work required in these specifications.

B. Portland Cement: Conform to ASTM C150.

C. Use additives for improving intrusion characteristics conforming to the Federal Highway Project (FP-85), Corps of Engineers specifications, ASTM or AASHTO. “Grout Fluidifier” manufactured by Concrete Chemicals Company of Cleveland, Ohio is acceptable. “Grout Fluidifier” inhibits early stiffening, decreases bleeding, eliminates shrinkage, and increases fluidity.

D. Use water that is fresh, clean, and free from deleterious quantities of oil, acid, alkali, salts, organic matter, or similar substances.

E. Use fine aggregates and/or bulk fillers consisting of sand, silt, clay or a combination of these materials conforming to Federal Highway Project, FP-85, Section 502, or Corps of Engineers CW-03362.

PART 3 EXECUTION

3.1 MONITORING

A. Monitor the structures subjected to pressure grouting due to the operations to ensure that maximum deflection of the basement walls below the floor slab will not exceed 0.01 foot, or cause visible cracking. Monitor the outside of basement walls midway between intersecting walls at quarter points along the full height of the wall.

3.2 PLACING INJECTION POINTS

A. Use the "split spacing" method of injection point location. Grout inject primary injection points. After grout injection at these points has been completed, secondary points may be required midway between the primary points. Further splitting of injection point spacing may be required depending upon results obtained in previous grouting operations.

B. Place primary injection points to the maximum anticipated penetration depth. Depths of the subsequent injection points depend upon the results obtained at previous locations.

C. Injection points may be driven or drilled in place. Ensure that the method of placement does not unnecessarily disturb the soil structure by consolidation or plugging of void spaces in a manner which would significantly reduce the potential quantity of grout that will be injected at the interface between the soil and the injection pipes.

D. Provide adequate size injection pipes or drill holes to permit injection of the most viscous mix appropriate without undue "head loss" due to hydraulic friction. The minimum and maximum diameter should not be less than that of 3/4 inch pipe or should not exceed 2 inches.

E. Submit to LANL accurate injection points and installation records, that include information regarding location, depth, method of installation, and other pertinent data such as "driving logs" and blow count data.

3.3 GROUT INJECTION PROCEDURES

A. Use the "stage up" grouting method for grouting. Start grout injection at maximum depths and continue as the injection point is withdrawn to minimum depth unless LANL has granted prior written approval for another method. Continuously monitor grout consumption and the condition of adjacent soil surfaces as an indication of effective grouting pressures. Do not allow build-up of pressures great enough to cause excessive deflections of the basement walls below the floor slab.

B. A primer of lubricating solution may be injected prior to the Portland Cement Grout to maintain/reduce required injection pressures and/or to increase the probability of confinement of the grout under pressure.

C. Verify that upon completion of the grouting procedures, the interface between structural elements involved with the soil are supported by grout, stabilized soil materials, or a combination thereof.

D. Submit to LANL grouting reports including grout mix proportions, injection pressures, and quantities of grout injected at each location and the sequence of grouting operations, and proportioning of grout mixes.

E. Upon completion of the jacking, seal drill holes flush with the surface of the slab with an accelerated setting sand/cement mixture or other approved material.

3.4 EQUIPMENT

A. Use only approved mixing and pumping equipment (including the items described below) in the preparation and handling of grout. Remove oil or other rust inhibitors from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with grout before the mixers are used. Equipment includes, but is not limited to, the following items:

1. Specially equipped grout pump capable of operating at a minimum discharge pressure of 100 psi or as required by site conditions.

2. A power operated grout mixer specifically designed for the proper mixing of pumpable slurry together with a mechanically agitated slump, if necessary, to maintain uninterrupted grout supply.

3. Valves, pressure gauges, pressure hoses, supply lines, and small tools, as required to insure a continuous supply of grout under accurately controlled pressure.

B. Maintain additional equipment, parts, and supplies necessary to ensure that grouting procedures will continue with minimal interruptions due to equipment failure.

3.5 MIX PROPORTIONS

A. Measure materials by volume, weight, or other approved means. Add sand or bulk filler to the mixture as warranted to enhance confinement of the grout under pressure if approved by LANL. Submit to LANL records of pumping time, pressures, volume, locations, and slumps.

B. Adjust the grout mix proportions for each point of injection and for each new batch of grout, as required, to obtain and maintain optimum grouting performance.

END OF SECTION

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Do not delete the following reference information.

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FOR LANL USE ONLY

This project specification is based on LANL Master Specification 31 3200 Rev. 0, dated January 6, 2006.